

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Geologic and Structure Contour Maps of the
Gallup East Quadrangle, McKinley County,
New Mexico

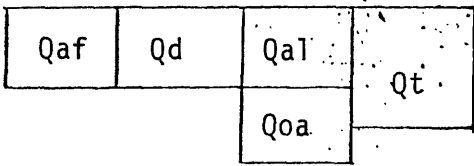
By
Morris W. Green and
Timothy J. Jackson

Open-File Report 76-453

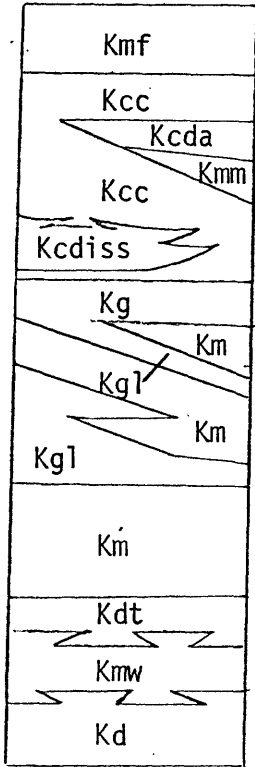
1976

This report is preliminary and has not been
edited or reviewed for conformity with U.S.
Geological Survey standard or nomenclature.

CORRELATION OF MAP UNITS

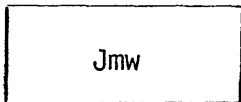


} Holocene
 } Pleistocene (?)
 } QUATERNARY

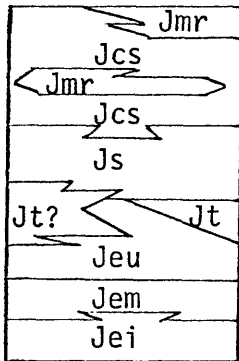


}
 }
 }
 } Upper Cretaceous
 } CRETACEOUS

UNCONFORMITY

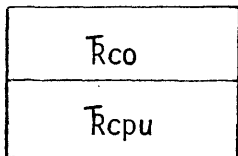


UNCONFORMITY



}
 }
 } Upper Jurassic
 } JURASSIC

UNCONFORMITY



}
 } Upper Triassic
 } TRIASSIC

DESCRIPTION OF MAP UNITS

SURFICIAL DEPOSITS

- Qaf ARTIFICIAL FILL AND MINE DUMPS
- Qd EOLIAN DEPOSITS (HOLOCENE)--Unconsolidated deposits of
windblown sand and silt
- Qal ALLUVIUM AND COLLUVIUM (HOLOCENE)--Unconsolidated deposits
of silt, sand, and gravel in stream valleys, on flood
plains, and on upslope areas adjacent to bedrock outcrops;
includes alluvial fan deposits
- Qt TALUS, LANDSLIDE, AND SLUMP BLOCK DEPOSITS (HOLOCENE AND(OR)
PLEISTOCENE?)
- Qoa OLDER ALLUVIAL AND EOLIAN DEPOSITS (HOLOCENE AND PLEISTOCENE?)--
Grayish-orange to yellowish-gray unconsolidated to partially
consolidated silt, sand, and gravel which forms terrace
and blanket deposits located topographically above
modern valley flood plains, and within dissected piedmont
alluvial plains, fans, and pediments

BEDROCK DEPOSITS

MENEFEE FORMATION (UPPER CRETACEOUS)

Kmf Allison Member--Predominately light olive-tan to light to dark-gray silty clay shales and siltstone, and very minor amounts of thin (less than 12 inches (30 cm)) subbituminous coals, lignites, and black shales; unit contains lenses of light-tan to light-gray and red to orange-pink very fine to medium-grained silty to well-sorted feldspathic quartz sandstone; internal structures of these lenses include scour surfaces with associated clay galls, horizontal parallel bedding with ripple marks, small-scale trough crossbedding, and medium-scale trough crossbedding. Upper contact is not present in the Gallup East Quadrangle; lower contact is gradational with the underlying Crevasse Canyon Formation.¹

Thickness incomplete, estimated 900 feet (274.3 m)

CREVASSE CANYON FORMATION (UPPER CRETACEOUS)

Kcc

Cleary Coal, Gibson Coal, Bartlett Barren, and Dilco Coal

Members undifferentiated²--Predominately medium-gray to light- or dark-gray siltstone, sandy siltstone, and clayey siltstone with minor amounts of medium-gray claystone and dark-gray silty carbonaceous claystone; black shales, lignites and thin (less than 12 inches (30 cm) thick) subbituminous coals occur in lenses throughout the formation; thicker coal lenses (1-5 feet (0.3-1.5 m)) are more common in the lowermost part (basal 270 feet (81.3m)) and uppermost part (upper 200 feet (61.0 m)); contains numerous lenses of light-tan, light-gray, and light-red very fine to medium-grained silty to well-sorted clay cemented slightly feldspathic and micaceous quartzose sandstone; sandstone lenses in the basal part of the formation, and lateral to the lower Dalton Sandstone member are locally conglomeratic; internal structures of the sandstone lenses include irregular scour surfaces with associated clay galls, horizontal planar crossbedding with ripple marks, small-scale trough crossbedding, medium-scale trough crossbedding, and large-scale wedge-planar crossbedding; sandstone lenses interfinger with surrounding finer grained beds. Lower contact with the basal sandstone bed of the Crevasse Canyon Formation³ is interfingering. The unit

is approximately 984 feet (300 m) thick in the western half of the quadrangle and 970 feet (295.7 m) thick in the eastern half, including the Dalton Sandstone Member

Kcda

Dalton Sandstone Member--Drab-tan to orangish-tan very coarse grained silt to very fine grained sandstone; well-sorted quartzose, slightly gypsiferous, with scattered very fine carbonaceous flakes; internal structures include (in descending order) horizontal or very gently dipping parallel laminae, structureless zones or horizontal parallel or small-scale trough crossbedding, hummocky crossbedding (sets with gently undulating, erosional lower boundaries overlain by "draped" laminae which grade upward to horizontal parallel laminae), and horizontal parallel laminae. The upper part of this sequence of internal structures is rarely preserved. Sequence has been worked out over a large area. Unit contains trace fossils, including tracks and numerous burrows (Ophiomorpha?); fossils of pelecypods and gastropods are common in basal part. Contact with underlying Mulatto Tongue of the Mancos Shale is gradational and interfingering where it is present; upper contact gradational and interfingering. To the southwest, unit laterally interfingers and grades into lenticular sandstones of the undifferentiated Crevasse Canyon Formation. Unit contiguous with lower bed of the Dalton Sandstone to the north and east; upper bed not present within the quadrangle. Thickness 0-80 feet (0-24.4 m)

Kcdiss Basal sandstone bed of the Crevasse Canyon Formation³--
Moderate orange-pink to yellowish-gray coarse-grained to conglomeratic poorly sorted angular clay cemented quartzose feldspathic sandstone; internal structures include irregular scour surfaces with as much as 10 feet (3 m) relief (clay galls are prevalent), large-scale trough crossbedding, large-scale wedge-planar crossbedding, very large scale wedge-shaped cosets of parallel to high-angle crossbed sets and very large scale sigmoidal cosets of parallel to high-angle crossbed sets; unit often underlain by 10 feet (3 m) of silty clay shales, carbonaceous shales, claystone, and subbituminous coal. Sandstone bed consists of interfingering, overlapping and stacked sandstone lenses, which laterally interfinger and grade into finer material. Thickness 0-200 feet (0-61.0 m)

GALLUP SANDSTONE (UPPER CRETACEOUS)

- Kg Main body--Buff to pink very fine to medium-grained locally coarse-grained well-sorted micaceous slightly gypsiferous sandstone, with scattered very fine carbonaceous flakes and occasional wood fragments; internal structure is very similar to the Dalton Sandstone described above. Upper contact with the Crevasse Canyon Formation is sharp in the northeast, to interfingering in the central and southern areas of the quadrangle; basal contact with the Mancos Shale sharp and interfingering. Unit thickest in northeast, thinning to the southwest. Thickness 35-140 feet (10.7-42.7 m)
- Kg1 Lower beds--Buff very fine to medium-grained moderate- to well-sorted silty slightly micaceous quartzose sandstone. Three beds are present in quadrangle separated by tongues of uppermost part of the main body of Mancos Shale. Toward the northeast, in the area of White Rock Canyon, the lowermost bed bifurcates, separated by an unmapped medial shale (0-10 feet (0-3 m) thick); and the medial sandstone bed thins to a pinch-out. Southwest from the same area, the lowermost and medial sandstone beds thicken and merge, though a persistent bed of Mancos Shale (unmapped where less than 10 feet (3 m) thick) separates them as far south as the Puerco River; and the uppermost bed merges into the basal part of the main

body of the Gallup Sandstone. Upper contacts sharp, lower contacts gradational. Individual beds in northeast part of quadrangle range from 0 to 32 feet (0-9.8 m) thick. Bed in the central and southern parts ranges from 117 to 156 feet (35.7-47.5 m) thick, including the persistent Mancos Shale split

MANCOS SHALE (UPPER CRETACEOUS)

- Kmm Mulatto tongue--Tan silty clay to clayey silt shale interbedded with orangish-tan very fine grained silty micaceous sandstone; shales range from laminae to thin beds; sandstone beds are 1-17 inches (2.5-43 cm) thick, and have internal horizontal-parallel bedding with ripple marks, burrows, and load structures; unit is gypsiferous; contains fine carbonaceous flecks, often concentrated along bedding planes; fossiliferous (notably pelecypods). Contact with underlying undifferentiated Crevasse Canyon sharp, flat, and possibly paraconformable. Tongue thins to southwest, eventually pinching out. Thickness 0-10 feet (0-3 m)
- Km Main body--Dark olive-gray to light olive-tan friable silty clay shale; locally contains indistinct beds of yellowish-brown calcareous thin-bedded to laminated locally fossiliferous sandy siltstone. Upper 150-180 feet (45.7-54.9 m) more silty and intertongues with lower beds of the Gallup Sandstone. Basal contact with underlying Two Wells Tongue of the Dakota Sandstone is sharp. Thickness approximately 500-560 feet (152.4-170.7 m)

Kmw

Whitewater Arroyo Tongue--Dark-gray to yellowish-gray fossiliferous silty clay shale; contains several lenticular interbeds of siltstone; these siltstones locally calcareous and bioturbated, and most common in upper part of unit. Upper and lower contacts gradational with the Dakota Sandstone. Thickness 60-135 feet (18.3-41.1 m)

DAKOTA SANDSTONE (UPPER CRETACEOUS)

Kdt

Twowells Tongue--Buff fine- to medium-grained sandstone; locally fossiliferous; contains sandy siltstone interbedded with flaggy bioturbated sandstone, scattered fossiliferous limestones, and sandstones containing sets of long, very low angle wedge-planar crossbeds. Uppermost part is locally extensively burrowed in southcentral part of quadrangle, unit overlain by a 6-foot (1.8 m) thick coquina bed which rises stratigraphically to the north. Thickness 12-60 feet (3.7-18.3 m)

Kd Main body--Yellowish-brown to red fine- to medium-grained well-sorted low-angle wedge-planar or forset crossbedded or structureless feldspathic sandstone and coarse-grained moderately to poorly sorted forset crossbedded or structureless zones of feldspathic sandstone, conglomeratic sandstone, and conglomerates; all intertongue with light-gray to black clay to clayey silt shales, siltstones and lignites; minor beds of subbituminous coal present; all beds laterally discontinuous; entire unit carbonaceous, and plant imprints and fragments common; finely~~grained~~ sandstones locally bioturbated, with burrow structures often preserved. Upper contact with Whitewater Arroyo Tongue of the Mancos Shale gradational, basal contact with the Morrison Formation sharp and disconformable. Thickness 100-160 feet (30.5-48.8 m). There are two small uranium mines no longer in operation in the basal part

MORRISON FORMATION (UPPER JURASSIC)

Jmw Westwater Canyon Member--Brick-red to white medium- to very coarse grained poorly sorted friable arkosic clay cemented sandstone, locally conglomeratic; commonly contains lenses of silty sandstone and sandy siltstone; unit consists of interfingering, overlapping and stacked sandstone lenses, often with associated scour surfaces; internal structures of these lenses vary from small- to large-scale trough crossbedding to small- to large-scale wedge-planar crossbedding. Lower contact sharp and disconformable (Green, 1975). Thickness 102-240 feet (31.0-73.2 m)

- Jmr Recapture Member--Dark reddish-brown fine- to very fine grained moderately sorted silty sandstone; horizontal bedded to structureless; locally mottled white, especially at upper and lower boundaries; interbedded with the Cow Springs Sandstone; unit thickens and thins laterally. Thickness 0-180 feet (0-54.9 m)
- Jcs COW SPRINGS SANDSTONE (UPPER JURASSIC)--White, greenish-yellow, yellowish-green, and light yellowish-brown fine-grained well-sorted sandstone; locally mottled; locally silty; locally calcareous, often forming resistant calcareous ledges. Internal structures exhibited vary from horizontal-parallel bedding to low- to high-angle, trough to wedge-planar crossbedding, and structureless zones, each occurring within massive parallel units. Upper half of formation locally reddish-orange, and contains sets of large-scale low- to high-angle tangential crossbeds. Lower contact with the Summerville Formation gradational. Thickness 463-554 feet (141.1-168.8 m)
- Js SUMMERVILLE FORMATION (UPPER JURASSIC)--White to gray very fine grained well-sorted parallel units of alternating calcareous sandstone and silty sandstone; horizontal-parallel bedded and structureless zones. Thickness 20-54 feet (6.1-16.4 m)

Jt TODILTO LIMESTONE (UPPER JURASSIC)--Light- to dark-gray unfossiliferous sandy limestone; limestone wedges out in eastcentral area of quadrangle, its stratigraphic interval being marked by a stringer of granules and small black, white and gray pebbles of chert lateral to the wedge-out. Where queried, limestone is absent, but a highly calcareous fine-grained sandstone outcrops which is approximately laterally equivalent to limestone. Upper and lower contacts gradational. Limestone 0-30 feet (0-9.1 m) thick, calcareous sandstone equivalent 3-20 feet (0.9-6.1 m) thick

ENTRADA SANDSTONE (UPPER JURASSIC)

Jeu Upper sandstone member--Reddish-orange and grayish-white fine- to very fine grained well-sorted well-rounded friable to well-cemented calcareous sandstone containing large sets of medium- to high-angle sweeping crossbeds. Thickness 200-210 feet (61.0-64.0 m)

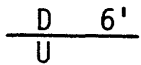
Jei Iyanbito Member⁴--Moderate reddish-orange fine- to medium-grained well-sorted well-rounded friable locally calcareous large-scale sweeping crossbedded sandstone; upper and basal parts of unit contain lenses of brick-red sandy siltstone. Lower contact not well exposed. Thickness 85 feet (25.9 m)

CHINLE FORMATION (UPPER TRIASSIC)

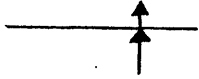
Tco Owl Rock Member--Gray to purple to reddish-brown nodular limestone and silty limestone; interbedded and gradational with light-green to dark reddish-brown locally calcareous locally bentonitic siltstone, silty claystone, and claystone. Siltstones horizontal-parallel bedded, locally sandy. Lower contact with Petrified Forest Member sharp. Thickness 106 feet (32.3 m)

Tcpu Petrified Forest Member, Upper part--Dark to light purplish-gray and reddish-gray bentonitic siltstone. Contains several thin medium to dark greenish- and purplish-gray fine- to coarse-grained poorly sorted micaceous sandstone beds. Base not exposed in map area. Thickness 268 feet (81.7 m)

CONTACT



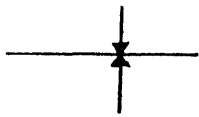
FAULT--Showing estimated amount of displacement in feet, where measured. U, upthrown side; D, downthrown side



MONOCLINAL FLEXURES--Upper and lower fold axes. Arrows indicate direction of dip. Longer arrow indicates flatter dip. Dashed where inferred



ANTICLINE--Showing trace of axial plan and direction of plunge; dashed where inferred



SYNCLINE--Showing trace of axial plane and direction of plunge; dashed where inferred



STRIKE AND DIP OF BEDS



STRIKE OF VERTICAL JOINTS



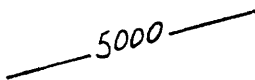
MINE OR PROSPECT



COAL OUTCROP--Subbituminous coals, greater than 14 inches (35 cm) thick. Thickness shown in feet where measured



BURNED OUT COAL BEDS--Outcrops of distinct orangish-red slag-like rock



STRUCTURE CONTOURS--Contoured on the base of Dakota Sandstone. Dashed where contoured surface eroded away. Numbers represent elevation above sea in feet. Contour interval 100 feet (30.5 m), 500-foot interval used in areas of steep gradients. Note: Due to the addition of new data, these contours do not precisely match those of the adjacent Church Rock geologic quadrangle (Green and Jackson, 1975)

FOOTNOTES

¹The lower boundary of the Menefee Formation has been defined as the upper limit of the Point Lookout Sandstone. (Beaumont and others, 1956, p. 2157.) Using this definition, the basal part of the Menefee Formation is composed of rocks having lithologies similar to those of the upper part of the Crevasse Canyon Formation, which underlies the Point Lookout Sandstone. This basal unit of the Menefee has been designated as the Cleary Coal Member by Beaumont and others. However, the Point Lookout Sandstone is absent in the area of the Gallup East Quadrangle. As a result, the Cleary Coal Member of the Menefee Formation lies directly upon the Crevasse Canyon Formation. Due to the similar aspects of these two units and lack of any recognizable contact, the Cleary Coal Member is included with the Crevasse Canyon Formation for purposes of mapping in this quadrangle, following the precedent of O'Sullivan and others (1972, p. E32). Thus the Menefee Formation is restricted to the Allison Member only in the Gallup East Quadrangle.

²The Crevasse Canyon Formation has been divided into four members (O'Sullivan and others, 1972, p. E31). These, in descending order, are the Gibson Coal Member, the Bartlett Barren Member, the Dalton Sandstone Member, and the Dilco Coal Member. The only member designation used on this map is the Dalton Sandstone Member, pertaining to a distinct laterally continuous unit of marine origin. Further division of the Crevasse Canyon Formation has not been pursued due to the difficulty of recognizing any distinct boundary having lateral persistence between what are lithologically similar rocks of fluvial and paludal origin.

³Basal sandstone unit named Torriovio Sandstone Member of the Gallup Sandstone by C. M. Molenaar (1973, p. 98).

⁴Unit placed in the Entrada Sandstone by M. W. Green (1974, p. 1-12); previous assignment was the Wingate Sandstone of the Upper Triassic.

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